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MEMORANDUM

DATE: August 21, 2006

TO: Joanne LaBaw, Task Monitor, EPA, Seattle, Washington, Mail Stop ECL-115

FROM: RN Renee Nordeen, START-3 Project Leader, E & E, Seattle, Washington

SUBJECT: Hazard Ranking System Score
Larson Air Force Base Titan Missile Facility S-3
Royal City, Grant County, Washington

REF: Contract Number EP-S7-06-02
Technical Direction Document Number: 06-01-0023

cc: Name, START-3 Project Manager, E & E, Seattle, Washington

A Hazard Ranking System (HRS) Score of 3.66 was derived for the xx site, which is located near Royal City, Grant County, Washington, as part of a preliminary assessment (PA). The site is a former United States Department of Defense (DoD) Titan intercontinental ballistic missile lunch facility that operated from 1962 to 1966. Currently, the site is used by B & G Farms to store out-of-service equipment and other miscellaneous items. The only remaining DoD era features are the missile silos and a building foundation.

B&G Farms is under investigation by the Washington State Department of Ecology for possible contamination relating to the storage of containers and drums at the site.

The HRS scoresheets, which were generated using QuickScore version 2.3 software, are attached. The following information and assumptions were used to derive the score.

Sources:

- **Containers.** Empty and partially full containers of herbicides are present at the site. Some containers are labeled as containing "Paraquat" and "Drexel Dynamyte II", a product that has dinoseb as it's active ingredient. The volume of these containers is not known. It is estimated that 100 five-gallon containers remain at the site. The hazardous waste quantity value for this source is 1 (i.e., [(500 gallons / 200 gallons per cubic yard) / 2.5 for Tier C). The containment factor value for this source for all pathways is 10.

- **Drums.** Empty and partially full drums of herbicides are present at the site. Some containers are labeled as containing "Paraquat" and "Drexel Dynamyte II". It is estimated that fifty 55-gallon containers remain at the site. The hazardous waste quantity value for this source is 5.5 (i.e., [(2,750 gallons /500 for Tier C). The containment factor value for this source for all pathways is 10.
- **Contaminated Soil.** Soil contaminated with dinoseb and paraquat from leaking herbicide containers and drums, and lead from burned lead acid batteries exist at the site. Sufficient sampling has not been conducted to determine the area of contaminated soil. It is estimated that contaminated soil covers approximately one acre of land. Based on this estimate, the hazardous waste quantity for this source is 1.28 (i.e., 43,560 square feet per acre/34,000 for Tier D). The containment factor value for all pathways for this source is 10.

Groundwater Migration Pathway:

- Due to the presence of a variety of drums and tanks at the site and shallow groundwater conditions, an observed release to groundwater has been assumed. The onsite well has been sampled and did not contain dinoseb above detection limits. The sample was analyzed for several other herbicides which also were not present above detection limits. Drinking water wells within the Target Distance Limit (TDL) are assumed to be subject to potential contamination.
- The highest toxicity/mobility factor value that can be assigned is 100 based on lead as the contaminant of concern.
- The net precipitation factor value is 1.
- Two principal aquifer systems are present in the general area of the site: the Yakima Basalt aquifer and the unconsolidated deposits aquifer. However, at the site, only the Yakima Basalt aquifer appears to be present. The onsite drinking water well appears to be in this aquifer. Hardpan approximately 20 feet thick is present between the ground surface and the top of the aquifer. This unit is expected to represent a geologic discontinuity between the ground surface and the aquifer.
- The precise depth to the aquifer is not provided in the well log for the onsite well, but the missile silos are flooded. For this reason, groundwater is estimated to occur at less than 25 feet below ground surface. A depth to aquifer factor value of 5 is assigned.
- Hardpan 21 feet thick is the densest layer between the ground surface and the aquifer. The hydraulic conductivity is expected to be 10^{-6}.
- A travel time factor value of 15 is assigned.
- The nearest well is located on-site. The nearest well factor value is 20.
- Approximately 149.92 people use groundwater for drinking water within the 4-mile target distance limit (TDL). The population using groundwater for drinking water by distance ring is as follows:

Distance Ring	Population	Distance Weighted Population Value
0 to ¼ mile	1	4
¼ to ½ mile	0	0
½ to 1 mile	8.76	1
1 to 2 miles	32.12	3
2 to 3 miles	40.88	7
3 to 4 miles	67.17	4
Total distance weighted population value		**19/10 = 1.9 → 2**

- Groundwater is used for irrigation of greater than 5 acres of commercial food crops. discussed in the PA report. A resource factor value of 5 is assigned.
- The site is not in a wellhead protection area. A wellhead protection area factor value of 0 is assigned.

Surface Water Migration Pathway:

- An observed release to the surface water migration pathway is not assumed. Local surface water features consist primarily of irrigation ditches in this arid location. All surface water targets are assumed to be subject to potential contamination.
- Two probable points of entry (PPEs) for the surface water migration pathway exists for the site. The first is located to the west in an unnamed intermittent ditch which flows south approximately 0.4 mile to an unnamed intermittent canal. This canal flows west approximately 13 miles to the Columbia River. The 15-mile TDL for this PPE ends 1.6 miles downstream in the Columbia River. A second PPE is located approximately 0.25 mile to the north of the site on an unnamed intermittent stream used for irrigation. This stream ends approximately 10.5 miles downstream of the site.
- The stream flow rates of the unnamed ditch, the unnamed canal, and the unnamed stream are not known. The START-3 estimates the flow rate of the unnamed ditch to be less than 1 cubic foot per second (cfs) and that of the unnamed canal and unnamed stream to be between 1 and 10 cfs. The estimated average annual flow rate of the Columbia River for 2003 was 100,600 cfs as measured near the unnamed canal's confluence with the river.
- The upland drainage area at the site is expected to include only the site itself, or 53.20 acres. A drainage area value of 2 is assigned.
- Soils at the site consist of well drained Kennewick fine sandy loam. A soil group designation of B is assigned for the site.
- The 2-year 24-hour rainfall event is 1.0 inch. A rainfall/runoff value of 0 is assigned.
- The runoff factor value for the site is 1.

- The distance from the sources at the site to surface water is less than 100 feet. A distance to surface water factor value of 25 is assigned.
- The site is not located in a floodplain. A floodplain factor value of 0 is assigned.

Drinking Water Threat:

- No drinking water intakes exist within the 15-mile TDL. Surface water within the TDL consists primarily of irrigation ditches and canals. Surface water features are not considered to be potable.
- The Columbia River is a major water recreation area. A resource factor value of 5 is assigned.

Human Food Chain Threat

- The highest toxicity/persistence/bioaccumulation factor value that can be assigned is 5,000 based on lead as the contaminant of concern.
- A food chain individual factor value of 0 is assigned.
- Fishing occurs on the Columbia River. It is estimated that 150 pounds of fish were harvested from this river within the 15-mile TDL.

Surface Water Body Type	Type of Harvest	Pounds of Harvest	Human Food Chain Value	Dilution Weight	Dilution Weighted Target Value
Very large river	Fish	150	0.3	0.00001	0.00003
Total TDL dilution weighted target value				**0.00003/10 = 0.000003**	

Environmental Threat

- **The highest ecotoxicity/persistence/environmental bioaccumulation factor value that can be assigned is $5x10^7$ based on lead as the contaminant of concern.**
- No Federal- or State-listed endangered and threatened species occur within the 15-mile TDL.
- Approximately 0.19 mile of wetland frontage exists within the 15-mile TDL: 0.04 mile is present along the banks of the unnamed stream to the north of the site, and 0.15 mile is present along the banks of the unnamed canal to the south of the site. Since these drainages do not combine, they are considered as two watersheds for scoring purposes. For this reason, only the drainage with the greatest length of wetlands will be included in the site score.

Surface Water Body Type	Total Length of Wetland (miles)	Assigned Value	Dilution Weight	Dilution Weighted Target Value
Minimal Stream	Wetlands	25	1	25
Total TDL dilution weighted target value			**25/10 = 2.5 → 3**	

Soil Exposure Pathway:

- Exposed contaminated soil likely does exist at the site.
- The highest toxicity factor value that can be assigned is 10,000 based on lead as the contaminant of concern.

Resident Population

- One person lives in a trailer at the site. It is assumed that this person is subject to Level I concentrations. No schools, daycare facilities, or work places at the site. The resident individual factor value is 50.
- No workers are routinely present at the site. A workers factor value of 0 is assigned.
- No resources such as commercial agriculture, silviculture, livestock production or commercial livestock grazing occur on an area of contamination. A resource factor value of 0 is assigned.
- No terrestrial sensitive environments are documented on an area of contamination.

Nearby Population Threat

- The site is fenced and has an unlocked gate. The site is known to be used occasionally by adventure divers for sport diving. For scoring purposes, the site is considered to be accessible with slight public recreation use. The area of exposed contaminated soil is estimated to be one acre or 43,560 square feet. Based on this information, a nearby population likelihood of exposure factor value of 5 is assigned.
- A nearby population likelihood of exposure factor value of xx is assigned.
- The nearest individual is between 0 and 0.25 mile of the site. A nearby individual factor value of 1 is assigned.
- Approximately 55 people reside within a 1-mile travel distance as follows:

Distance Ring	Population	Distance Weighted Population Value
0 to ¼ mile	0	0.1
¼ to ½ mile	5.8	0.05
½ to 1 mile	48.3	0.3
Total distance weighted population value		**0.45/10 = 0.045**

Air Migration Pathway:

- An observed release to the air migration pathway is not assumed. Targets are subject to potential contamination.

- A gas potential to release factor value can not be assigned since the contaminants of concern do not have published gas migration factor values.
- The highest particulate containment factor value assigned to a source at the site is 10; the highest particulate source type factor value is 22 (i.e., for contaminated soil), and the highest particulate migration potential factor value is 17 (i.e, for central Washington). The particulate potential to release value is 390 (i.e., 10 x [22 + 17]).
- The nearest resident is located between 0 and 1/8 mile of the site. The nearest individual factor value is 20.
- Approximately 478 people reside within 4 miles of the site as follows:

Distance Ring	Population	Distance Weighted Population Value
On-site	1	4
0 to ¼ mile	1	1
¼ to ½ mile	5.8	0.2
½ to 1 mile	48.3	0.9
1 to 2 miles	104	0.8
2 to 3 miles	141.3	0.4
3 to 4 miles	176.6	0.2
Total distance weighted population value		**7.5/10 = 7.8 → 8**

- Federal- and State-Listed endangered or threatened species occur within the 4-mile TDL as follows:

Distance Ring	Sensitive Environment/Wetland (acres)	Assigned Value	Dilution Weight	Dilution Weighted Target Value
0 to ¼ mile	Wetlands – 0	0	0.25	0
¼ to ½ mile	Wetlands – 2.7	25	0.054	1.35
½ to 1 mile	Wetlands – 23.7	25	0.016	0.4
1 to 2 miles	Wetlands – 48.1	25	0.0051	0.1275
2 to 3 miles	Wetlands – 247.2	250	0.0023	0.575
3 to 4 miles	Wetlands – 364.7	350	0.0014	0.56
	Federal Candidate species and State-listed threatened Ferrunginous hawk (*buteo regalis*)	50		
Total TDL dilution weighted target value			3.0125/10 = 0.30125	

If you have any questions regarding this memorandum or its assumptions, please contact me at 206-624-9537.

****** CONFIDENTIAL ******
******PRE-DECISIONAL DOCUMENT ******
****** SUMMARY SCORESHEET ******
****** FOR COMPUTING PROJECTED HRS SCORE ******

****** Do Not Cite or Quote ******

Site Name: Larson AFB Titan Missile Facility S-3

Region: 10

City, County, State: Royal City, Grant wa

Evaluator: L. Costello

EPA ID#: WAN001002636

Date: 4/25/2006

Lat/Long: 45o 54' 29" N/ 119o 45' 15"W

T/R/S: T16N / R24E / Section 1

Congressional District: 4

This Scoresheet is for: PA

Scenario Name:

Description: Former ICBM launch facility, currently used by new operators to store agricultural supplies, empty herbicide containers, lead-acid batteries, and used tires.

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	1.08	1.1664
Surface Water Migration Pathway Score (S_{sw})	0.62	0.3844
Soil Exposure Pathway Score (S_s)	7.2	51.84
Air Migration Score (S_a)	0.314836363636364	0.0991219358677688
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		53.4899219358678
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		13.372480483967
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4}$		3.66

✶ Pathways not assigned a score (explain):

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated:			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	550	
2. Potential to Release:			
2a. Containment	10	10	
2b. Net Precipitation	10	1	
2c. Depth to Aquifer	5	5	
2d. Travel Time	35	15	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	210	
3. Likelihood of Release (higher of lines 1 and 2e)	550		550
Waste Characteristics:			
4. Toxicity/Mobility	(a)	100	
5. Hazardous Waste Quantity	(a)	10	
6. Waste Characteristics	100		6
Targets:			
7. Nearest Well	(b)	20	
8. Population:			
8a. Level I Concentrations	(b)	0	
8b. Level II Concentrations	(b)	0	
8c. Potential Contamination	(b)	2	
8d. Population (lines 8a + 8b + 8c)	(b)	2	
9. Resources	5	5	
10. Wellhead Protection Area	20	0	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		27
Ground Water Migration Score for an Aquifer:			
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000][c]	100		1.08
Ground Water Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		1.08

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Watershed Evaluated:			
Drinking Water Threat			
Likelihood of Release:			
1. Observed Release	550	0	
2. Potential to Release by Overland Flow:			
2a. Containment	10	10	
2b. Runoff	10	1	
2c. Distance to Surface Water	5	16	
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	35	170	
3.Potential to Release by Flood:			
3a. Containment (Flood)	10	10	
3b. Flood Frequency	50	0	
3c. Potential to Release by Flood (lines 3a x 3b)	500	0	
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	170	
5. Likelihood of Release (higher of lines 1 and 4)	550		170
Waste Characteristics:			
6. Toxicity/Persistence	(a)	10000	
7. Hazardous Waste Quantity	(a)	10	
8. Waste Characteristics	100		18
Targets:			
9. Nearest Intake	50	0	
10. Population:			
10a. Level I Concentrations	(b)	0	
10b. Level II Concentrations	(b)	0	
10c. Potential Contamination	(b)	0	
10d. Population (lines 10a + 10b + 10c)	(b)	0	
11. Resources	5	0	
12. Targets (lines 9 + 10d + 11)	(b)		0
Drinking Water Threat Score:			
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100		0
Human Food Chain Threat			
Likelihood of Release:			
14. Likelihood of Release (same value as line 5)	550		170
Waste Characteristics:			
15. Toxicity/Persistence/Bioaccumulation	(a)	50000	
16. Hazardous Waste Quantity	(a)	10	
17. Waste Characteristics	1000		18
Targets:			
18. Food Chain Individual	50	0	
19. Population			
19a. Level I Concentration	(b)	0	
19b. Level II Concentration	(b)	0	
19c. Potential Human Food Chain Contamination	(b)	3E-6	
19d. Population (lines 19a + 19b + 19c)	(b)	0	
20. Targets (lines 18 + 19d)	(b)		0
Human Food Chain Threat Score:			
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100		0
Environmental Threat			
Likelihood of Release:			
22. Likelihood of Release (same value as line 5)	550		170
Waste Characteristics:			
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	50000000	
24. Hazardous Waste Quantity	(a)	10	
25. Waste Characteristics	1000		100

Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)	0	
26b. Level II Concentrations	(b)	0	
26c. Potential Contamination	(b)	3	
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	3	
27. Targets (value from line 26d)	(b)		3
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		0.62
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score[c] (lines 13+21+28, subject to a max of 100}	100		0.62
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated)	100		0.62

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Exposure:			
1. Likelihood of Exposure	550		550
Waste Characteristics:			
2. Toxicity	(a)	10000	
3. Hazardous Waste Quantity	(a)	10	
4. Waste Characteristics	100		18
Targets:			
5. Resident Individual	50	50	
6. Resident Population:			
6a. Level I Concentrations	(b)	10	
6b. Level II Concentrations	(b)	0	
6c. Population (lines 6a + 6b)	(b)	10	
7. Workers	15	0	
8. Resources	5	0	
9. Terrestrial Sensitive Environments	(c)	0	
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)		60
Resident Population Threat Score			
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)		594000
Nearby Population Threat			
Likelihood of Exposure:			
12. Attractiveness/Accessibility	100	25	
13. Area of Contamination	100	20	
14. Likelihood of Exposure	500		5
Waste Characteristics:			
15. Toxicity	(a)	10000	
16. Hazardous Waste Quantity	(a)	10	
17. Waste Characteristics	100		18
Targets:			
18. Nearby Individual	1	1	
19. Population Within 1 Mile	(b)	0.45	
20. Targets (lines 18 + 19)	(b)		1.45
Nearby Population Threat Score			
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)		130.5
Soil Exposure Pathway Score:			
22. Pathway Score[d] (S_s), [lines (11+21)/82,500, subject to max of 100]	100		7.2

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60
[d] Do not round to nearest integer

TABLE 6-1 --AIR MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Release:			
1. Observed Release	550	0	
2. Potential to Release:			
2a. Gas Potential to Release	500	0	
2b. Particulate Potential to Release	500	390	
2c. Potential to Release (higher of lines 2a and 2b)	500	390	
3. Likelihood of Release (higher of lines 1 and 2c)	550		390
Waste Characteristics:			
4. Toxicity/Mobility	(a)	8	
5. Hazardous Waste Quantity	(a)	10	
6. Waste Characteristics	100		2
Targets:			
7. Nearest Individual	50	20	
8. Population:			
8a. Level I Concentrations	(b)	0	
8b. Level II Concentrations	(b)	0	
8c. Potential Contamination	(c)	8	
8d. Population (lines 8a + 8b + 8c)	(b)	8	
9. Resources	5	5	
10. Sensitive Environments:			
10a. Actual Contamination	(c)	0	
10b. Potential Contamination	(c)	0.30125	
10c. Sensitive Environments (lines 10a + 10b)	(c)	0.3	
11. Targets (lines 7 + 8d + 9 + 10c)	(b)		33.3
Air Migration Pathway Score:			
12. Pathway Score (S_a) [(lines 3 x 6 x 11)/82,500][d]	100		0.314836363636364

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.
[d] Do not round to nearest integer